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Cartographic Representation of
Journey-to-Work Movements — 1971 Canadian Census

by

Lynne Dale



WORKING PAPER (Demographic and Socio-economic Series) No. 8

Ottawa, August 1971



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INTRODUCTION

Purpose

The journey to work question will be asked for the first time in Canada in the Census of 1971. From this census, huge quantities of journey-to-work data, tabulated by counties, municipalities, census metropolitan areas, and census tracts, will be available. It is planned to represent these tabular data in cartographic form to clarify the relationship between places of work and places of residence and to establish journey to work trends. The purpose of this paper, then, is to suggest mapping schemes for the various types of journey-to-work data which will be forthcoming from the 1971 Census.

Procedure

Research was done on books, articles, and reports in order to determine general trends and hypotheses concerning the journey to work. It was then possible to suggest certain features which would be of interest to map in order to test these theories. The sources were also researched in order to find maps showing journeys to work. These maps were studied and evaluated in order to determine which mapping methods would be most applicable to the pertinent data.

This paper is divided into three parts. The first is a survey of mapping methods currently employed in journey-to-work literature; the second suggests maps which could be done using place-of-work data which will be available from the 1971 Census; the third consists of practical suggestions for the illustration of the special census bulletin on the journey to work.

Part One: "Review of the Cartographic Methods Used for the Representative of the Journey to Work".

From a study of journey-to-work maps, it is evident that the various methods of mapping can be broadly classified into two groups: (a) movement and (b) distribution. The former consists of flow maps which use lines (with or without arrows) to show movement toward or away from the place of work. Distribution maps are static representations which use various symbols such as dots, circles, isopleths, and shading to show commuter origins or destinations. In addition, there are a number of possibilities for combining these methods.

The review of mapping methods was more developed than the examples given in this text. The maps in this paper have been selected for their clarity and ease of reproduction (the latter since colour cannot be used, limiting the maps to black and white).

1.1 Movement

Only when exact origins and destination of journeys to work are known is it possible to show patterns of movement by means of flow maps. Solid lines, broken lines, or arrows have been used in various maps to show movement toward the place of work.(1) Map 1 demonstrates the use of "desire lines" to show movement toward the workplace destination. While this particular map has a legend to show that a certain width of a line represents a specified number of people, another variation of this method adds the exact number of commuters to the origin end of the desire line.(2) It is feasible to combine these two ideas.

For footnotes see page 15.

Map 1



Fig. 6. Desire line diagram of spatial interaction—journeys from work to homes, 1966 for a selection of towns in the sub-region.

1.2 Distribution

There are various forms of distribution maps.

One of the most basic methods of quantitative maps is the dot map. This method has been used in journey-to-work maps to show the residential origins of commuters. The main problem associated with this method is in deciding how many commuters to represent by one dot so as to prevent either extreme clutter or scatter.(3)

Another method of quantitative mapping and somewhat more sophisticated than the simple dot map is the use of graded circles. Consideration must be given to what size of circle will represent what number of people and how many grades of circles are desired. Graded circles have been used in Map 2 to show the overlapping origins of commuters going to Manchester and Liverpool. This map has a well-explained legend and is interesting, yet is simple to understand.

Graded circles are often used in combination with shading in a number of ways. For instance, graded circles and shading may respectively represent the number of outcommuters and the percentage of resident employees which outcommutes, or the number of incommuters and the percentage of the work force which incommutes.(4) Map 3 is an example of the first case; the main fault to be found with this particular map is that the purpose of the shading is not well explained by the legend.

Graded circles can furthermore be divided to show, for example, the proportion of resident workers that outcommute or the proportion of male versus female commuters. Map 4 is one example of the former. Divided circles are not effective if too many divisions are attempted.

For footnotes see page 15.

Map 2

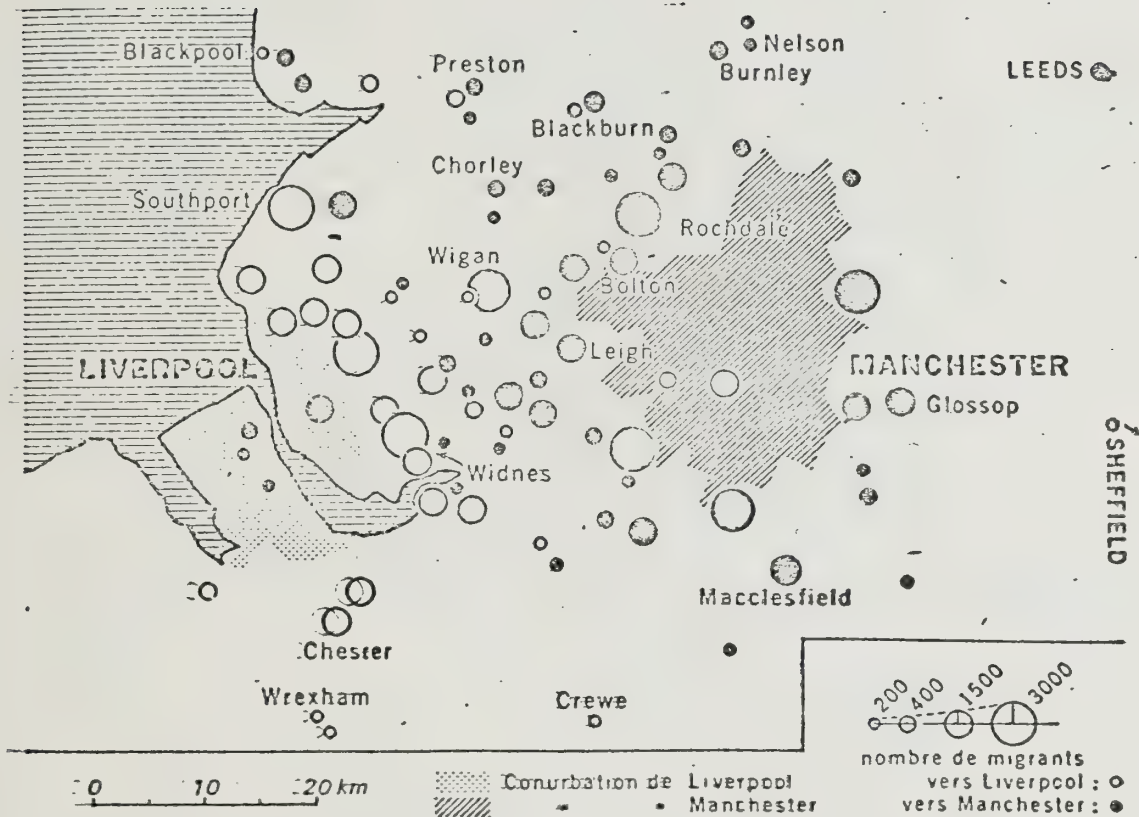
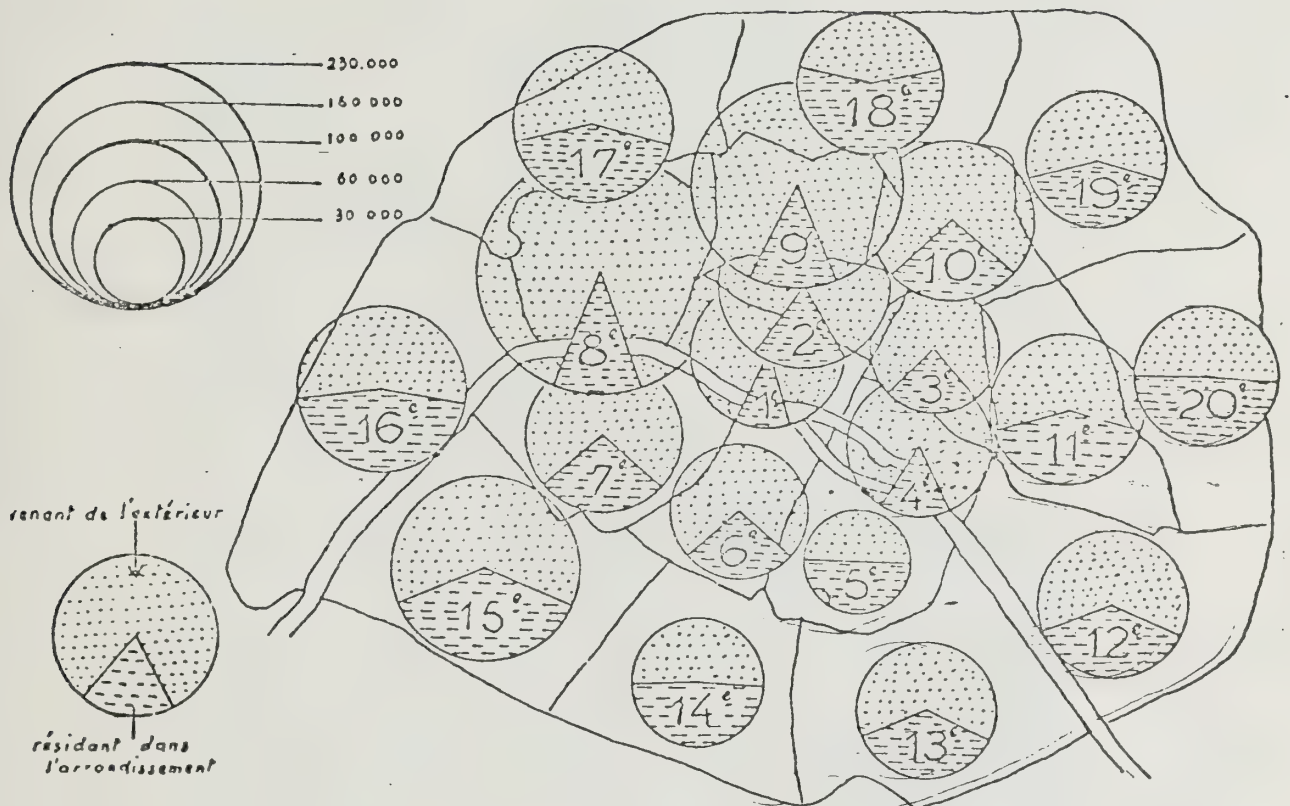


Fig. 4. — Les migrants journaliers
vers les conurbations de Liverpool et de Manchester.

Map 3



- Ville de Paris : Nombre de personnes travaillant dans chaque arrondissement selon qu'elles résident dans l'arrondissement ou qu'elles viennent de l'extérieur.

Belluorone, André. La Mobilité géographique d'une population.
Paris: Gauthier-Villars, 1966.

Map 4



Fig. 39. — Migrations pendulaires de la périphérie vers Lille

I. 1 à 49 migrants; 2. 50-99; 3. 100-199; 4. 200-399; 5. 400 et plus. I. 1 à 3,9 %; II. 4 à 7,9 %;
III. 8 à 15,9 %; IV. 16 à 31,9 %; V. 32 à 64,9 %; VI. 65 % et plus.

Beaujeu-Garnier, Jacqueline, et Georges Chabot. Traité de Géographie Urbaine. Paris: Armand Colin.

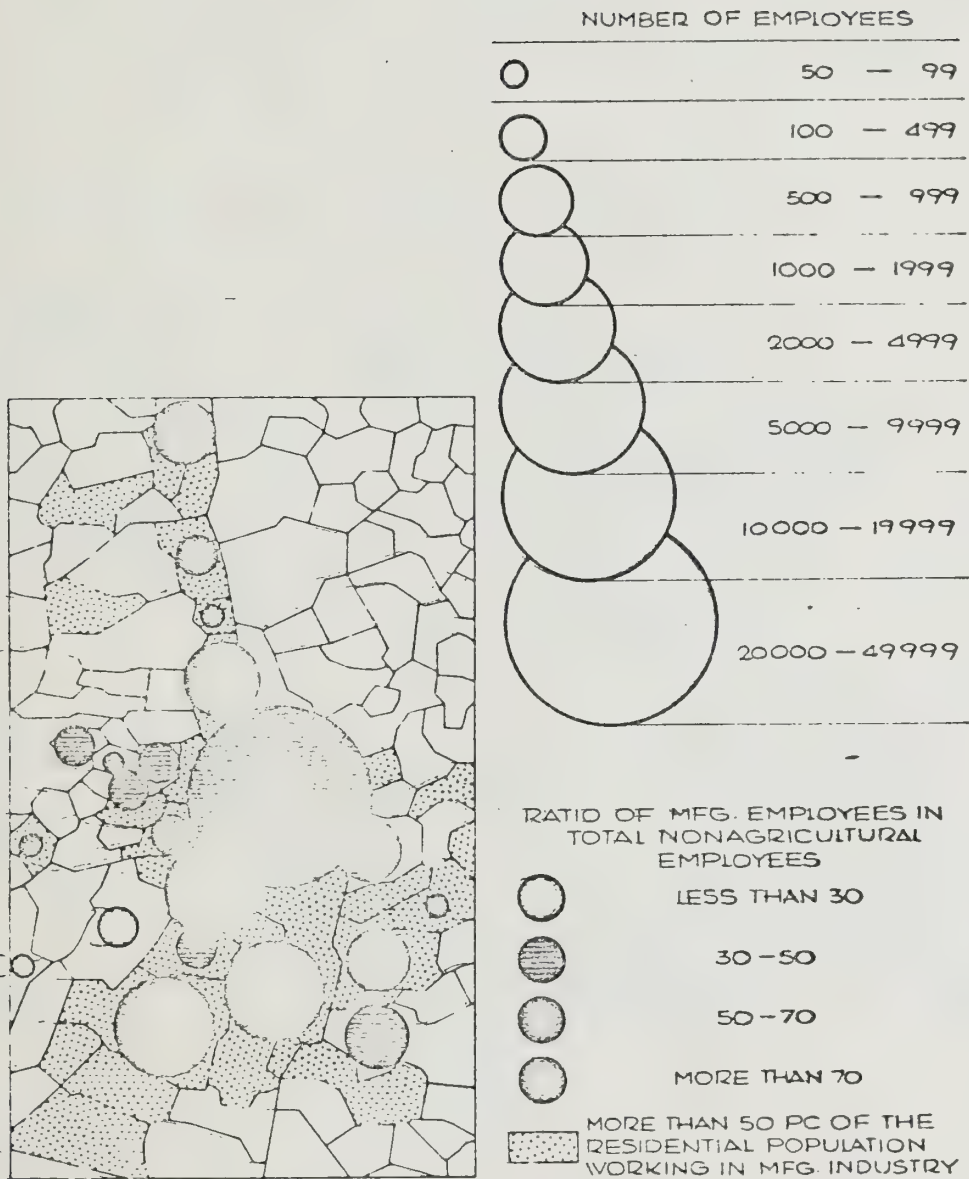
Map 5 shows how graded circles can be used to map the number of incommuters and outcommuters on the same map.

The isopleth map is a rather versatile method for mapping the distribution of commuters. Isopleths can be used to join places with equal numbers of commuters(5) or those places having a specified percentage of people commuting to a metropolis.(6) They are used to show areas around a city which send various percentages of their work forces to the central city - e.g. 50%, 5%, and 0%(7) or there may simply be one isopleth around the city to show the outer limit of all commuters.(8) Furthermore, isopleths can be used to show the labour shed for one city at a time(9) or on a nationwide level.(10) Map 6 demonstrates that even at the national level several isopleths can be drawn around each metropolis.

As was the case with isopleths, shading can likewise be used to show a number of phenomena including the number of commuters,(11) the number of incommuters as a percentage of the total labour force, the number of outcommuters as a percentage of resident workers, and the number of outcommuters to a specific city as percentage of all commuters from an area.(12) The main problem with shading is a lack of clarity. Sometimes too many categories using different patterns of dots, dashes, and lines, all in black and white, make the map difficult to read; general trends become hidden in a clutter of detail. Colour may help to solve this problem but could not be used in the present working paper. This therefore makes it essential to determine the proper number of breakdowns and shading designs. Maps 7 and 8 demonstrate that various impressions result from the number of possible ways of using shading; i.e., in the first, commuters to central London are expressed as a percentage of the total labour force in each area while in the second, they are

For footnotes see page 15.

Map 5



Industrial communities and their structure.

Boustedt, Olaf. "The Significance of Planning Atlases: The German Experience", The Canadian Geographer, VI, No. 1 (Spring, 1962), p. 31.

Map 6

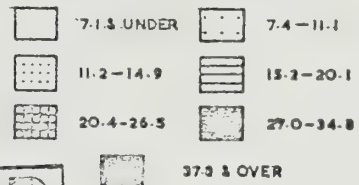


Berry, B.J.L., and F.E. Horton. Geographic Perspectives on Urban Systems. Englewood Cliffs: Prentice-Hall, 1970.

Maps 7 & 8

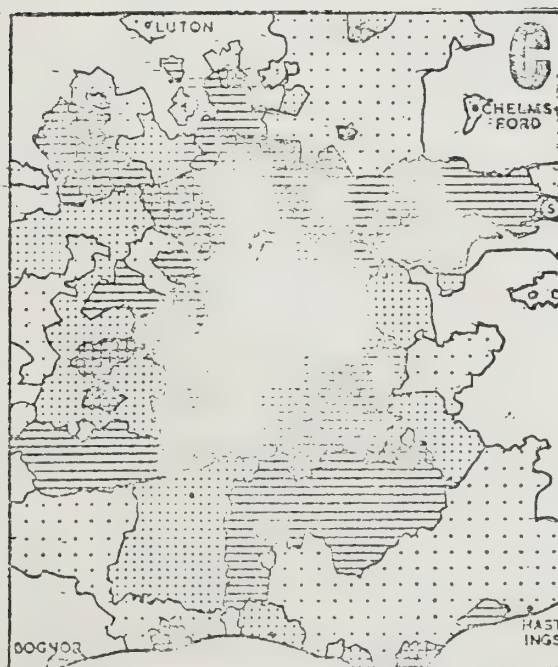
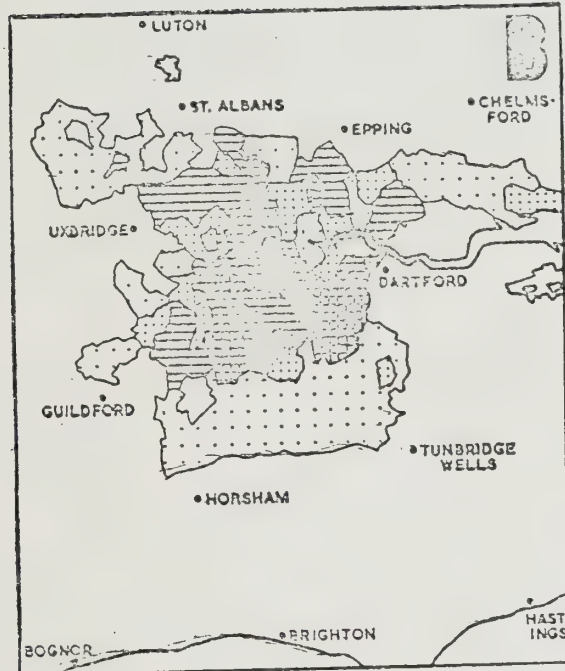
MAPS B & C

PERCENTAGE OF { OCCUPIED POPULATION MAP B
DAILY OUT-COMMUTERS MAP C }
EMPLOYED IN CENTRAL LONDON



(S) = SOUTHEND

0 10 20
MILES



expressed as a percentage of outcommuters. The latter more strongly emphasizes London's role as a centre of employment for surrounding areas.

1.3 Conclusion

The first part of this paper has reviewed various methods of mapping journey-to-work data as they are found in the literature. In the second section, the feasibility of these methods will be tested by applying them to data similar to that which will be available from the 1971 Census question on place of work.

FOOTNOTES

- (1) Bulletin de la société de la géographie. Annales de géographie. No. 417, Sept. — Oct. 1967, p. 526.
Caillot, Robert. L'usine, la terre et la cité. Paris: Les Éditions Ouvrières, 1958, p. (At back).
Cripps, E.L. and Foot, D.H.S. "A Land-use Model for Sub-regional Planning", Regional Studies, III, No. 3 (Dec. 1969), p. 255.
Dickinson, Robert E. "Commuting in West Germany", Annals of the Association of American Geographers, XLIX, 1959, p. 446.
Gerard, Roy. "Commuting and the Labor Market Area", Journal of Regional Science, I, No. 1 (Summer 1958), p. 127.
Watts, H.D. "Mid Wales: The Industrial Journey-to-Work in a Rural Area", Journal of the Town Planning Institute, LIV, No. 2 (Feb. 1968), p. 80.
- (2) Caillot, op. cit.
- (3) Lavedan, Pierre. Géographie des Villes. Paris: Gallimard, 1959, p. 251.
Taaffe, E.J., Garner, B.J., and Yeates, M.H. The Peripheral Journey to Work — A geographic consideration. Northwestern University Press, 1963.
- (4) Beaujeu — Garnier, Jacqueline, et Chabot, Georges. Traité de Géographie urbaine. Paris: Armand Colin, 1963, p. 403.
Institut national de la Statistique. Bulletin régional de statistique. 1^{er} trimestre, 1964, p. 12.
- (5) Dickinson, Robert E. "Commuting in West Germany", Annals of the Association of American Geographers, XLIX, 1959, p. 446.
Gibbs, Jack P. Urban Research Methods. New York: D. Van Nostrand Co., Inc., 1961, p. 291.
Lawton, R. "Journey to Work in Britain: Some Trends and Problems", Regional Studies, II, No. 1 (Sept. 1968) p. 29.
Taaffe, E.J. et al., op. cit.
- (6) Case Studies of Commuting Fields and Metropolitan Definition: Connecticut Background Report No. 3.
- (7) Berry, B.J.L. and Horton, F.E. Geographic Perspectives on Urban Systems, Englewood Cliffs: Prentice-Hall, 1970, pp. 44-45.
- (8) ibid, pp. 44-45.
- (9) Case Studies of Commuting Fields and Metropolitan Definition, op. cit.
- (10) Berry, B.J.L., and Horton, F.E. op. cit., pp. 43-45.
- (11) Institut national de la statistique. Bulletin régional de statistique. 4^e trimestre, 1956, p. 15.
- (12) Dickinson, Robert E. "Commuting in West Germany", Annals of the Association of American Geographers, XLIX, 1959, pp. 443-456.
Dickinson, Robert E. "The Geography of Commuting: The Netherlands and Belgium", Geographical Review, 47, 1957, pp. 521-538.

Part Two: "Cartographic Approach to the 1971 Canadian Tabulation Programme on Journey to Work".

The discussion of Part Two centres around sample tables which will record the data of the 1971 Census; the problem is to determine methods of mapping these data. The tables analyzed here are the most interesting for mapping geographical patterns but others which include socio-economic characteristics will also be available.

As there are as yet no Canadian data available, maps of Canadian journey-to-work patterns are not yet feasible. Therefore data were obtained from two other sources in order to test the applicability of the methods discussed in Part One. The 1966 Workplace Census of England and Wales was used to obtain data for mapping by counties and a study of the Waterloo Area supplied data for mapping at the municipality level. Only the most successful attempts will be included in this part, but the difficulties arising from the less successful maps will be mentioned.

2.1 Tables by Counties-- (See Tables in Appendices.)

(a) Tables Not Giving Origins and Destinations

The information compiled in Table 1 (a) is the "Place of Residence by Place of Work" while Table 1 (b) tabulates "Place of Work by Place of Residence". The limitations of this information must be realized before any attempt is made to suggest appropriate maps. The only place name given in Table 1 (a), for example, is that of the county of residence; the number of people working outside the county is tabulated, but there is no indication of the exact place of work. This lack of names prevents the use of flow maps which

obviously demand names of the places of both origin and destination. Therefore a method representing a static situation is required in this case.

The method of divided and graded circles as described in Part One was attempted for England. Map 9 shows this method applied to incommuters. Due to the variety of sizes of the counties, decision as to the size and number of graded circles was difficult. Because of the relatively few counties of over 1,000,000 in the labour force compared with the number under 500,000, circles towards the top of the scale are fewer and represent wider population differences while there are more smaller circles representing smaller differences.

Shading was not used (by itself) in mapping county data. If shading is used on a percentage basis (e.g. the percentage of resident employees which outcommutes) there is no indication of the number of outcommuters. This problem is overcome if graded circles are combined with shading as shown in Map 10. It is important to choose an appropriate number of divisions for shading groups and suitable designs to make the map easily understood. Another map (similar to Map 10) was attempted in which graded circles were used to represent the number in the labour force instead of the number of outcommuters; however, the former better demonstrated the strength of outcommuting in certain areas.

Map 11 shows in- and outcommuters on one map. The problem arises that, in some cases, the numbers of in- and outcommuters are almost the same so that they should be represented by the same size of circle. If the same size of circle is used for each, there is no rim left to indicate

MAP 9

INCOMMUTERS AS A PERCENTAGE
OF LABOUR FORCE WORKING
IN EACH COUNTY—1966

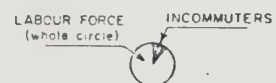
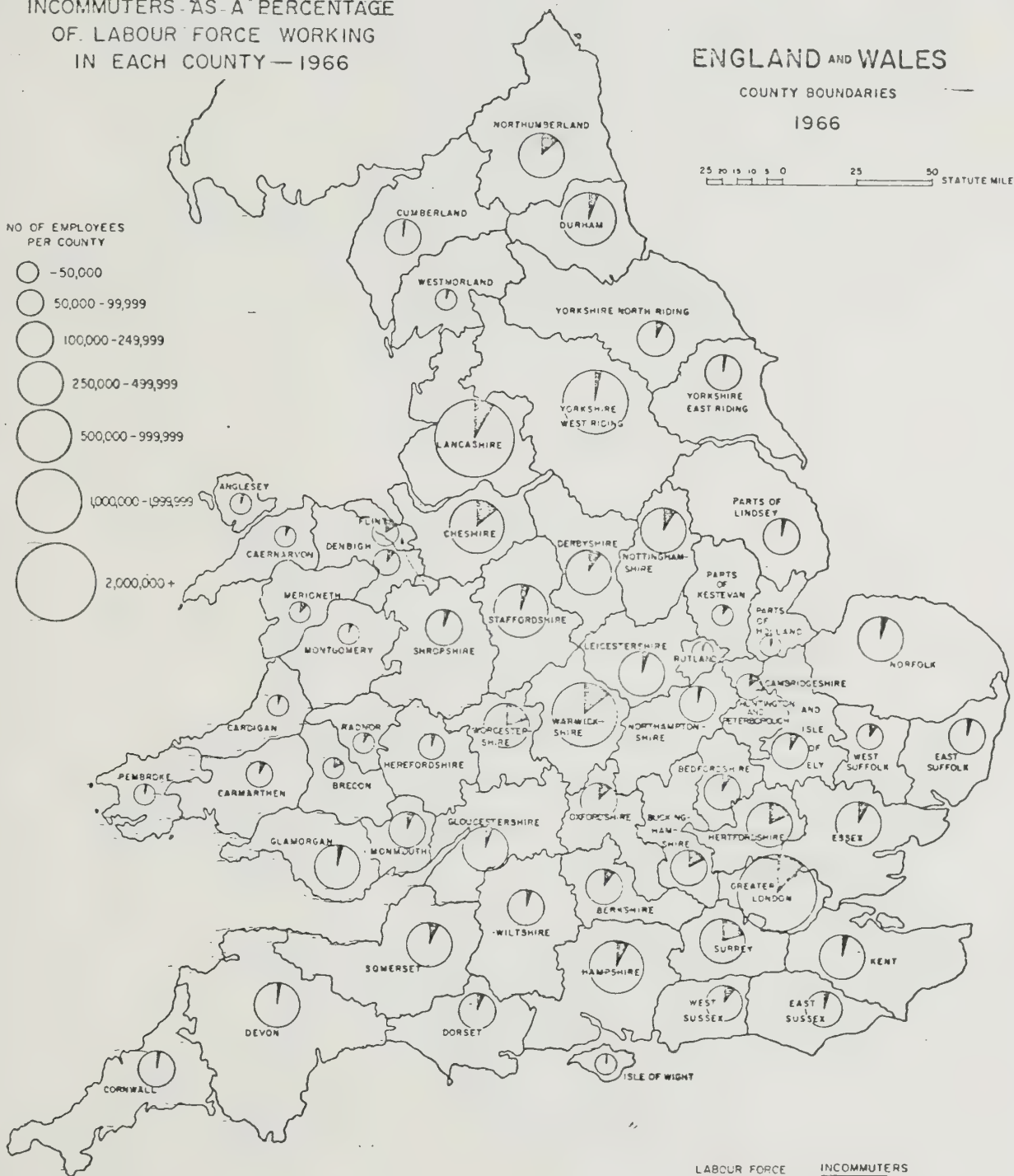
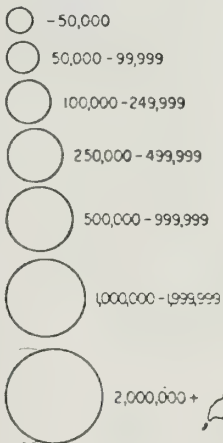
ENGLAND AND WALES

COUNTY BOUNDARIES

1966

25 20 15 10 5 0 25 50 STATUTE MILES

NO OF EMPLOYEES
PER COUNTY



MAP 10

OUTCOMMUTING

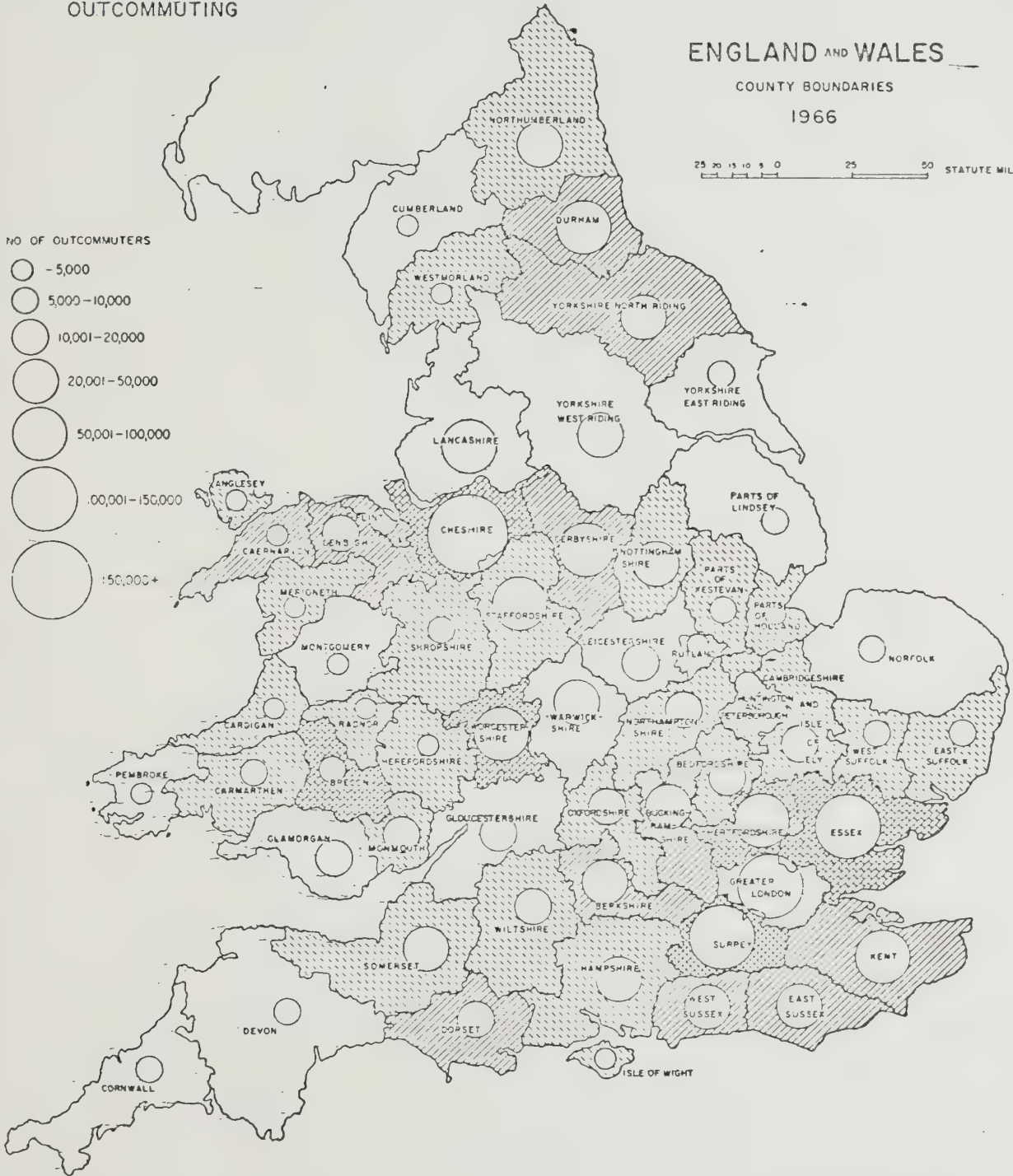
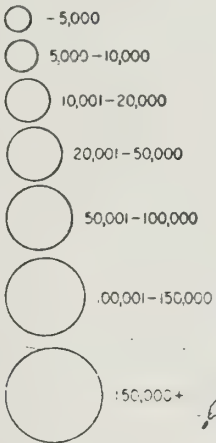
ENGLAND AND WALES

COUNTY BOUNDARIES

1966

25 20 15 10 5 0 25 50 STATUTE MILES

NO OF OUTCOMMUTERS



% OF RESIDENT LABOUR FORCE WHICH OUTCOMMUTES



MAP 11

COMPARISON OF INCOMMUTING AND OUTCOMMUTING

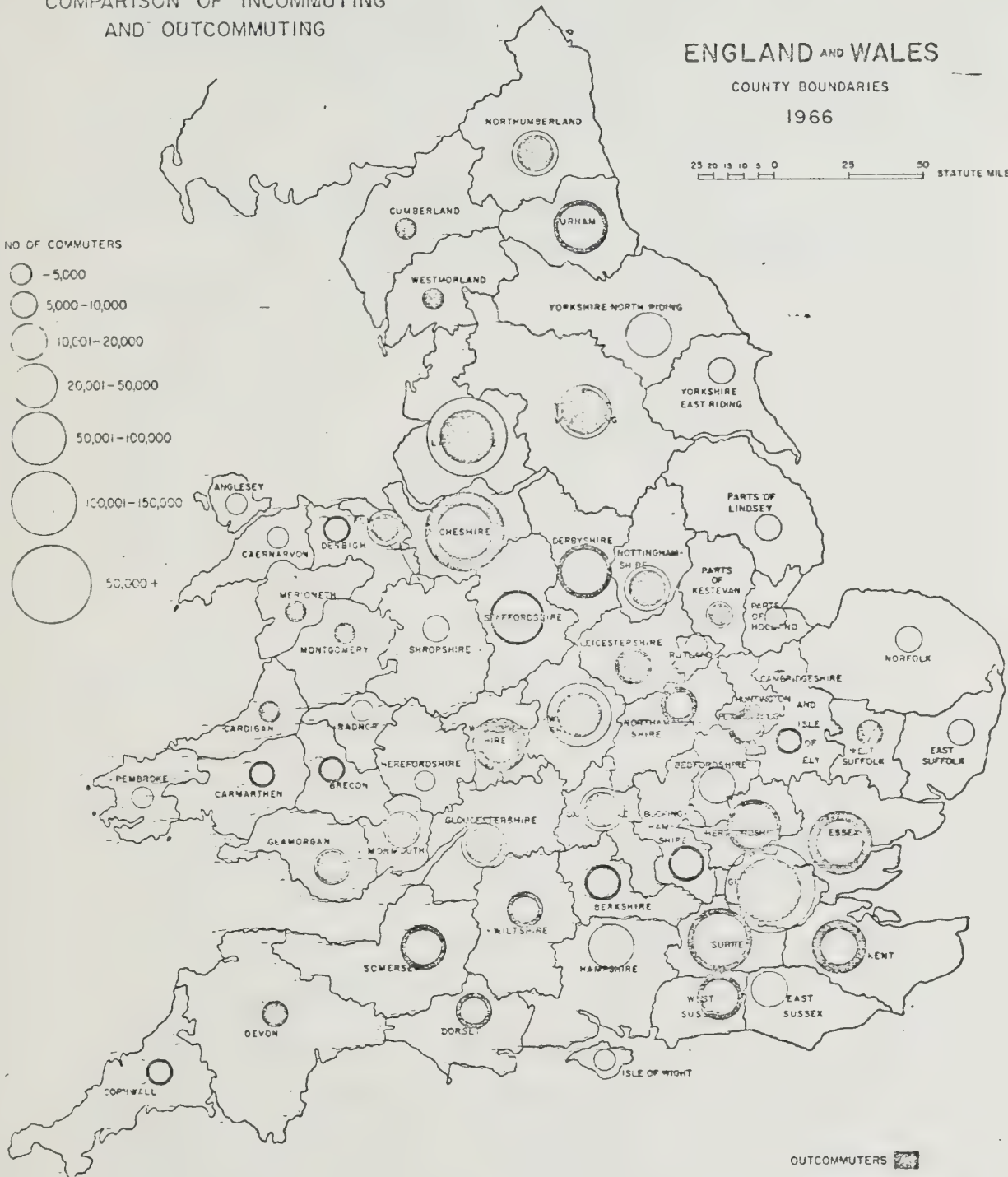
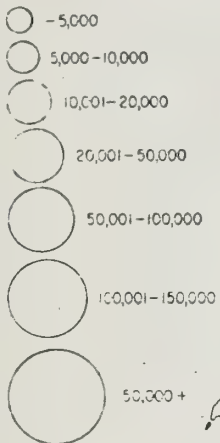
ENGLAND AND WALES

COUNTY BOUNDARIES

1966

25 20 15 10 5 0 25 50 STATUTE MILES

NO OF COMMUTERS



OUTCOMMUTERS

INCOMMUTERS

which group predominates. If it is attempted to show a rim, then the graded circles are not accurate. The main advantage of this method, however, is that in- and outcommuters can be represented on a single map.

(b) Tables Giving Origins and Destinations

Since actual place names are given in Tables 2 (a) and 2 (b) flow maps are feasible.

Shading is not a very appropriate method when one is interested in showing flow. Only one county (and its interaction with surrounding counties) can be considered at a time. When shading is combined with graded circles, attention must still be focused on one particular county. Neither of these methods was used because of this limitation.

Isopleths were of little interest because the county units are too large to show significant and accurate commuting patterns.

A map of desire lines in which the place of work was kept constant was attempted for England; it was not included since it was very similar to Map 1 of Part One. The number of attractive counties must be limited to a few at a time since otherwise confusion results from too many lines. It was also difficult to arrive at a suitable scale since the number of commuters ranged from 100 to over 100,000. It was decided that counties sending fewer than 200 commuters would not be considered for three reasons: first, the problem of scale; second, to avoid too many lines; third, their relative insignificance. Arrows had to be added in a few cases in which there was some confusion regarding the direction of movement.

2.2 Tables by Municipalities

Data are tabulated by municipalities in Tables 3 (a) and 3 (b). Since names of municipalities are specified, flow maps are possible. — The data used for the trial maps are taken from a Local Government Review of the Waterloo Area: Report of Findings and Recommendations.

Map 12 is a flow map showing the number of people commuting to Kitchener from surrounding urban and rural municipalities. For a map of a larger area, it would probably not be possible to retain this distinction between rural and urban. It is possible to have more than one attractive municipality on a map of a larger area, especially if they are far enough removed from each other to prevent a clutter of lines.

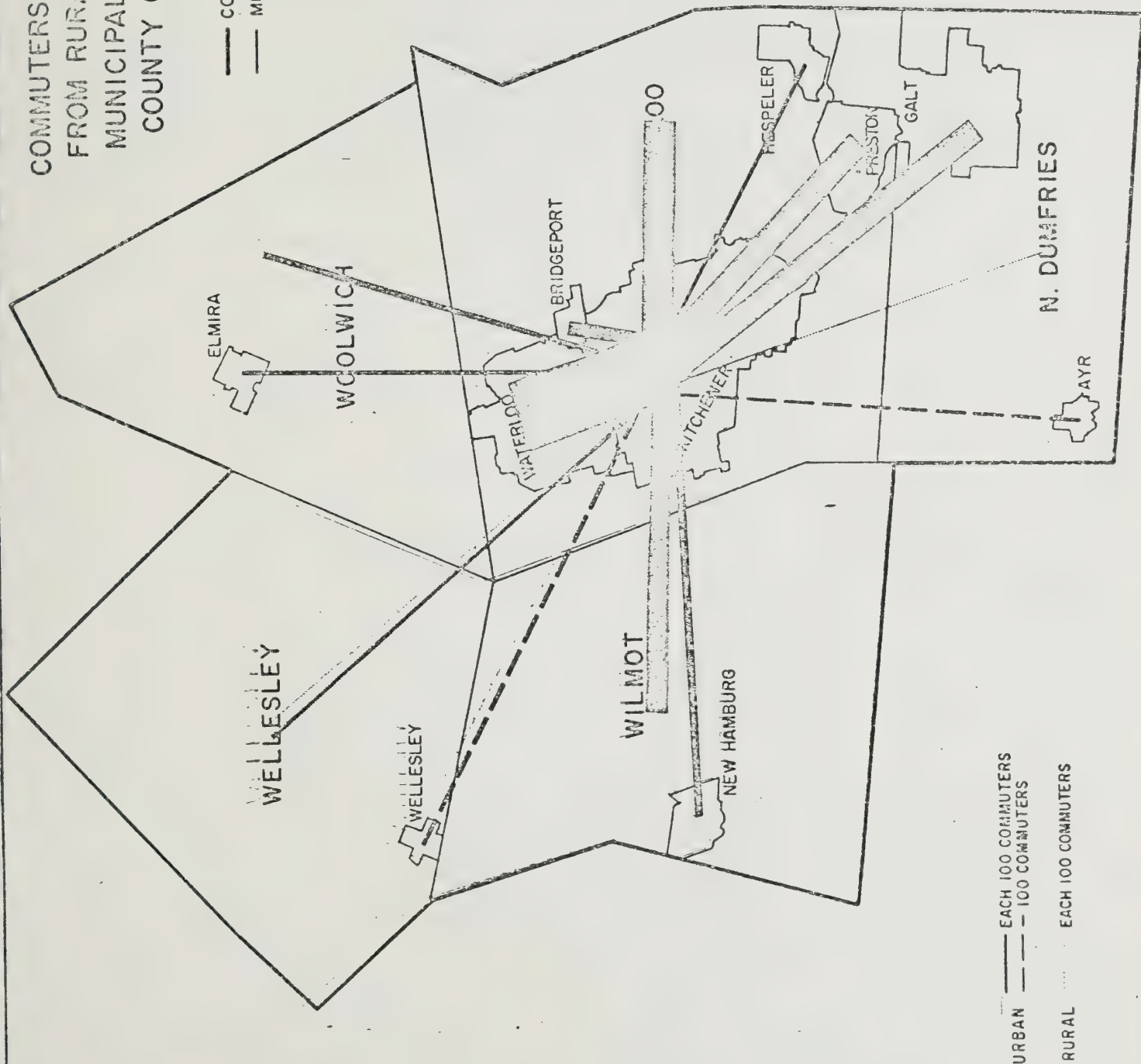
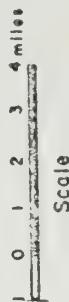
An isopleth map was attempted but was not of enough interest to be included. The main difficulty was that there were too few statistics for the size of the area, the result being that it was very difficult to know exactly where to locate the isopleth. The method would be of greater utility when municipalities are closer together (as would be the case on a smaller scale map).

Graded circles may be used to show overlapping commuter origins for two municipalities as in Map 13.

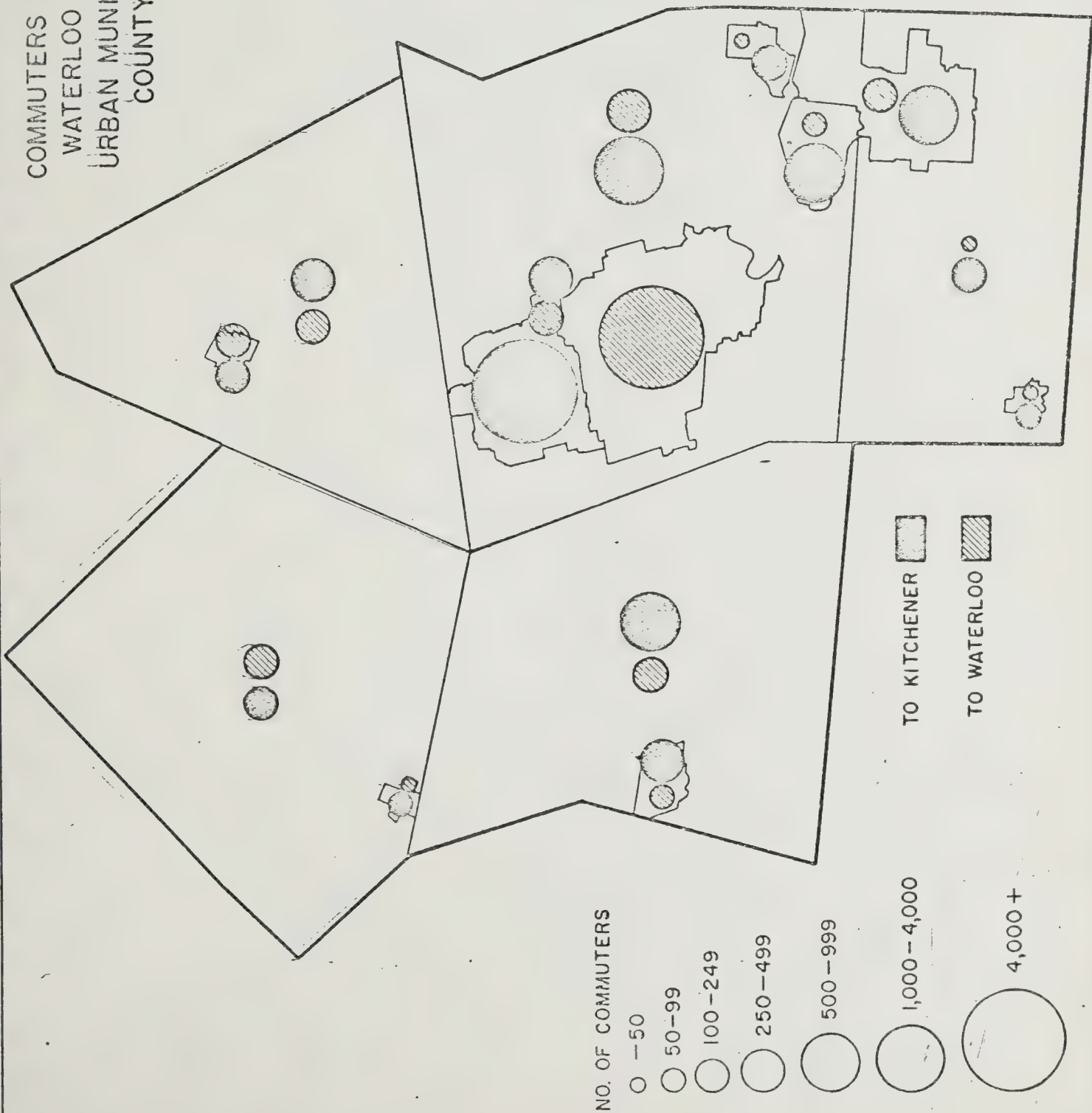
In Map 14 graded circles show the origin of commuters by rural and urban municipalities. A graded circle placed in the geographical centre of a rural municipality does not, unfortunately, give an accurate indication of commuter distribution within that municipality. Furthermore, this method is limited because only one municipality at a time may be considered as the workplace destination. These same problems make the dot map unfeasible and such a map has not been attempted for these reasons.

COMMUTERS TO KITCHENER FROM RURAL AND URBAN MUNICIPALITIES IN THE COUNTY OF WATERLOO

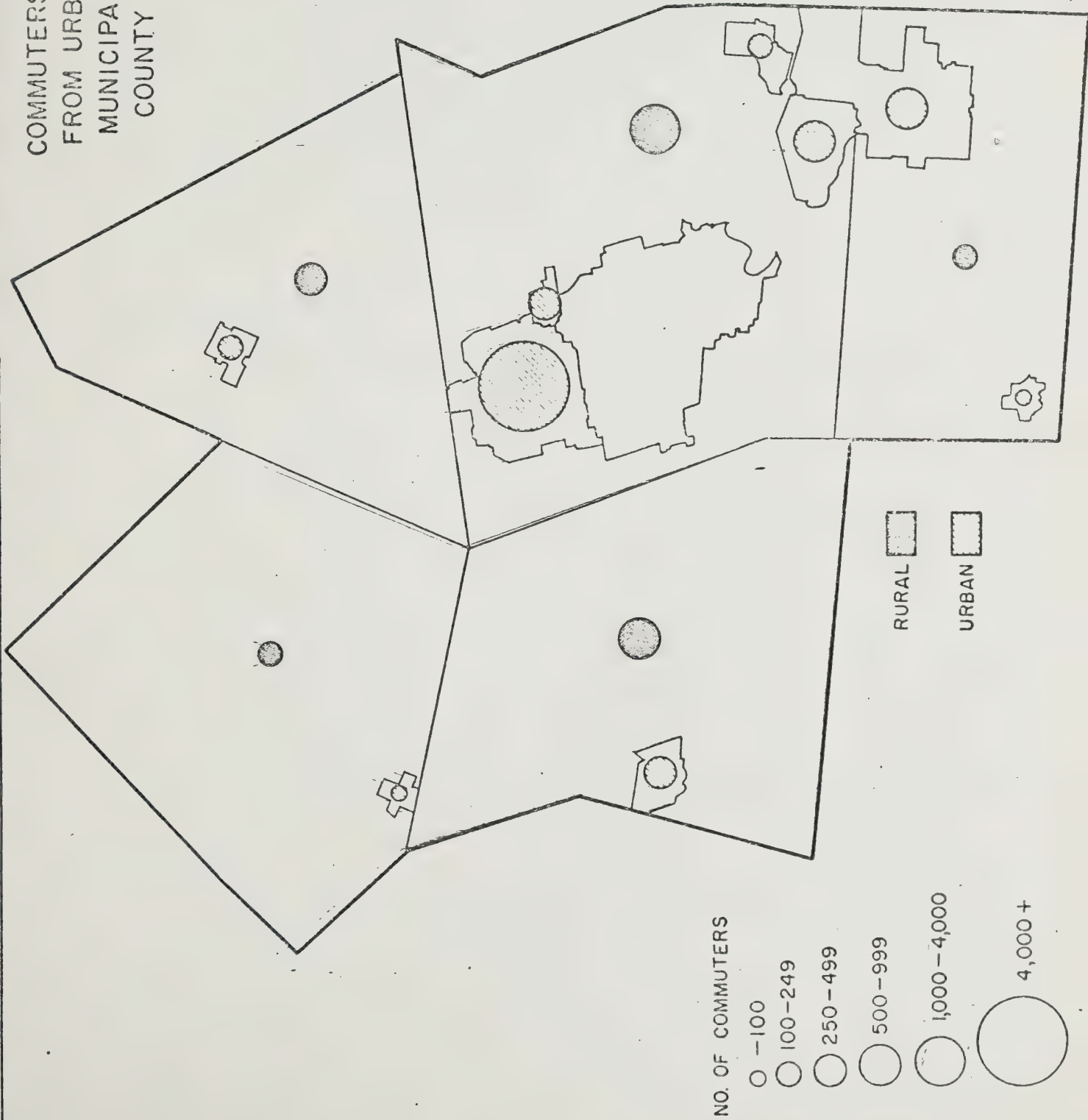
— COUNTY BOUNDARY
— MUNICIPAL BOUNDARY



COMMUTERS TO KITCHENER AND WATERLOO FROM RURAL AND URBAN MUNICIPALITIES IN THE COUNTY OF WATERLOO



COMMUTERS TO KITCHENER FROM URBAN AND RURAL MUNICIPALITIES IN THE COUNTY OF WATERLOO



In Map 15 divided circles were used to show what proportion of outcommuters from each municipality commute to Kitchener.

Shading was also attempted but was of little interest. When a municipality is all one colour, it looks as though commuting is equally significant throughout that municipality; this is, in fact, not the case. Shading was then combined with graded circles in Map 16. Variations on this method were also attempted-- e.g. using colours for shading, and different colours or symbols to distinguish between rural and urban municipalities.

2.3 Tables by Census Tracts

A variety of divided circles can be used to map data by CT, e.g. the number of in- or outcommuters as a proportion of the number of people living and working in the same CT, a breakdown of these in-or out-commuters into male and female; or the number of commuters may determine the size of the circle and the division can show male-female proportions.

If there is interest in one CT in particular, e.g. the Central Business District as a centre of employment, desire lines or graded circles can be used to show the origin of these employees.

The methods shown or mentioned for municipalities can also be used for census tracts since the tables will give origins and destinations.

2.4 Conclusion

In this section, some of the problems of mapping journey-to-work data (as they will be tabulated following the 1971 Census) have been discussed and examples of some of the more successful maps have been included. Part Three will deal with applying these methods to the mapping programme in the forthcoming Canadian census bulletins.

DEPENDENCE OF URBAN AND RURAL MUNICIPALITIES IN THE COUNTY OF WATERLOO ON KITCHENER AS A PLACE OF WORK

NO. OF OUTCOMMUTERS

○ - 100

○ 100-249

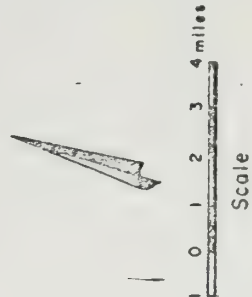
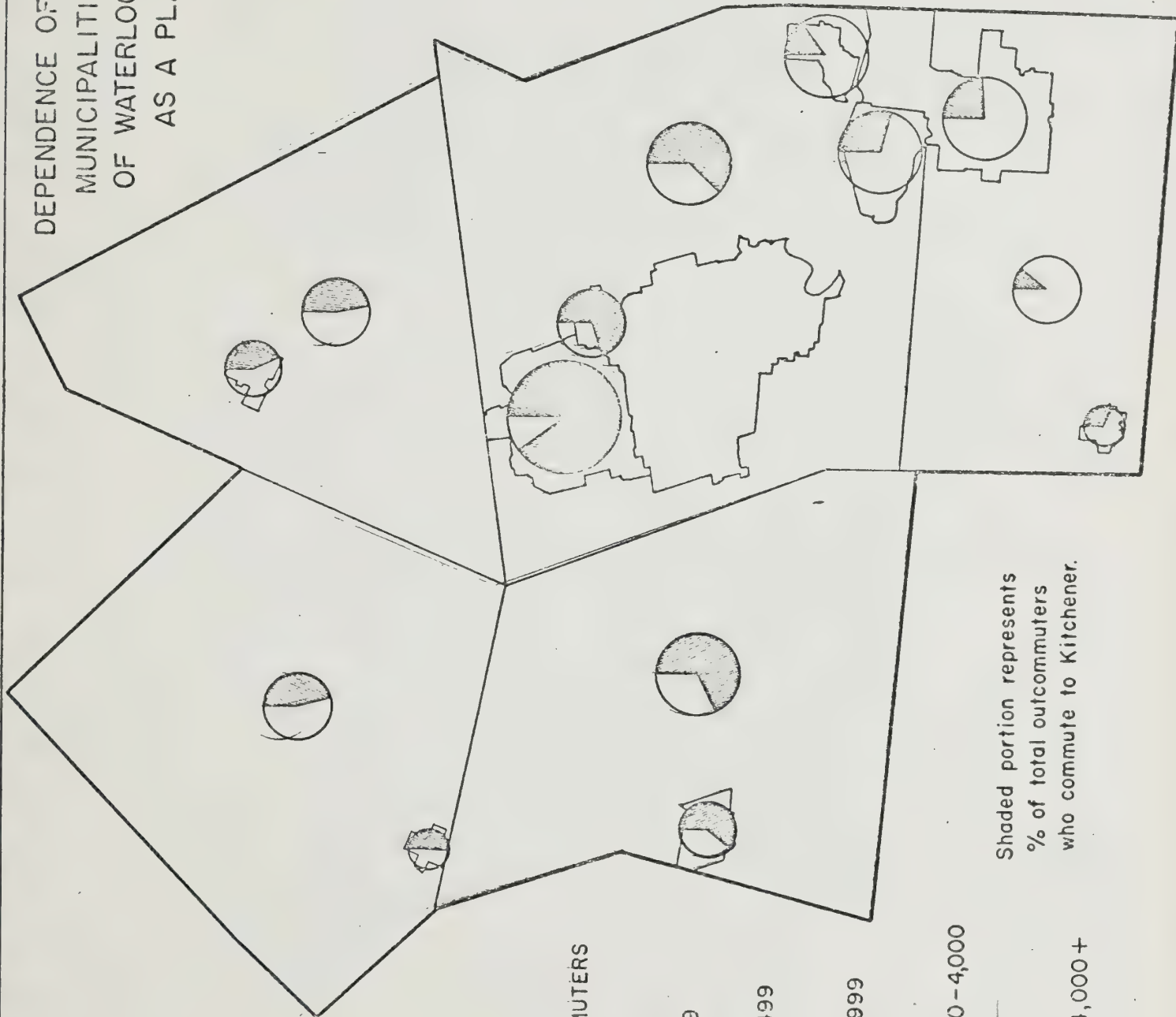
○ 250-499

○ 500-999

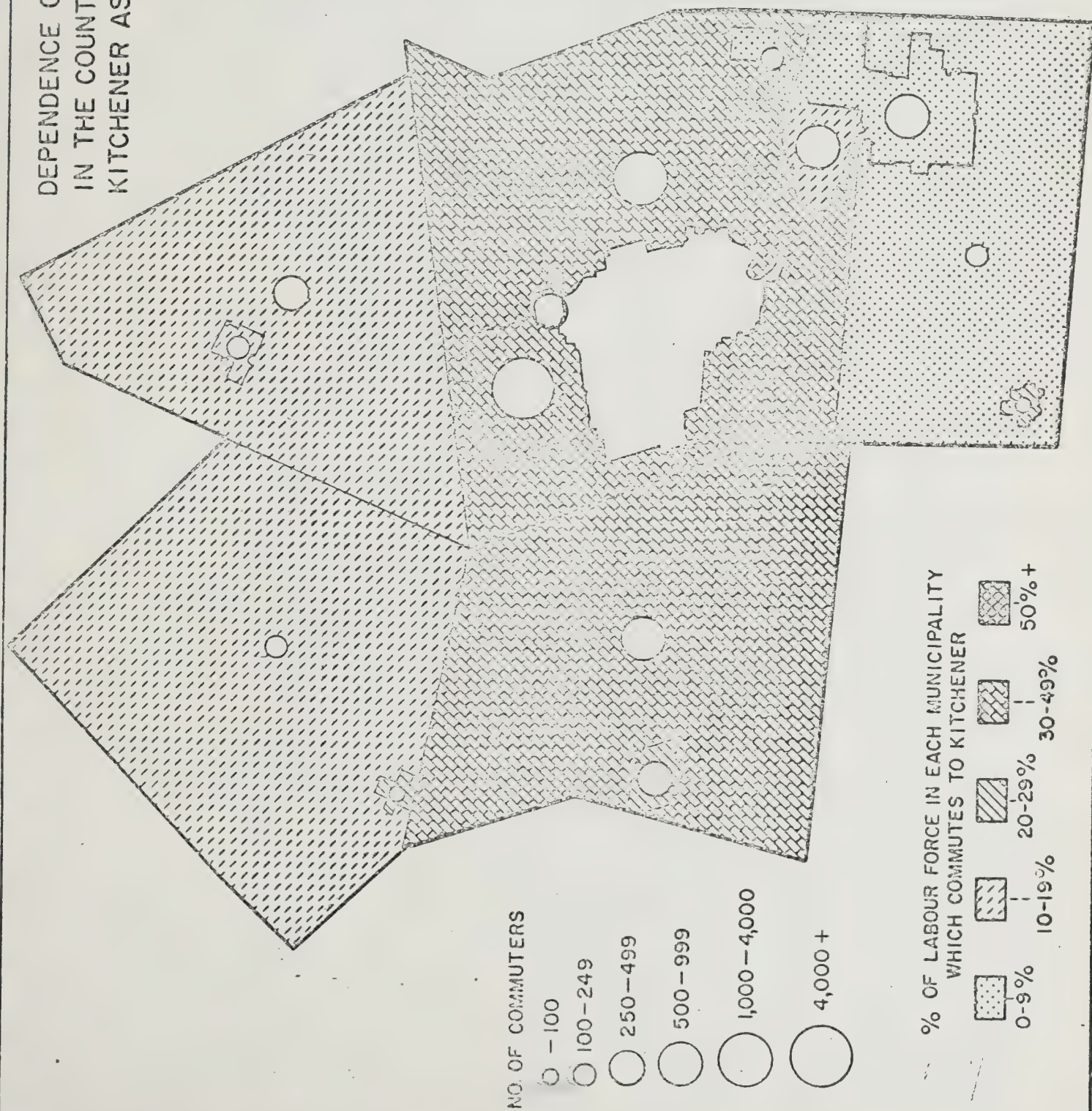
○ 1,000-4,000

○ 4,000+

Shaded portion represents % of total outcommuters who commute to Kitchener.



DEPENDENCE OF MUNICIPALITIES IN THE COUNTY OF WATERLOO ON KITCHENER AS A PLACE OF WORK



Part Three: "Recommendations for the Publication of Maps on the Journey to Work Prepared by the Geography Section".

This section deals with recommendations for the maps which will accompany the special bulletin on the place of work; the latter will be one of the publications following the 1971 Census.

3.1 Limitations of the Programme

In making final decisions regarding which types of maps can be used for publication, certain limitations must be kept in mind.

First, there is a limitation on the level at which mapping will be carried out. It is intended to publish place-of-work information in four volumes corresponding to the four major regions: Atlantic Provinces, Quebec, Ontario, and the Western Provinces. An analysis of the scale of map to be presented in this type of bulletin has already been done by D. Miller-Ion when she designed the cartographic programme for the publication of maps on population increase.⁽¹⁾ In order to get the maximum clarity for information on municipalities and still have a manageable size, she selected the following scales: 1:4,000,000 for the Atlantic Provinces, 1:2,000,000 for Quebec, 1:3,370,400 for Ontario, and 1:6,336,000 for the Western Provinces. Her suggestions will be accepted as such. Therefore, the scale of the maps will be quite small and this will limit the detail which can be shown. Furthermore, the number of maps should be limited to one map for each type of table — one for county without movement, one for county with movement, and one for municipality; this means that the total publication programme will be comprised of 12 maps. Thus each of these maps should be as significant as possible. Therefore, maps must be general enough to deal with data on a small scale but specific enough to be of interest. Secondly, there is the limitation

(1) This study is available at the Geography Section.

of time. Tabulation print-outs will not be available until April of 1972. Following this, the selection of origin—destination for publication, typing, printing, etc. will take another few months. The preparation of maps should not take longer than the selection of origins and destinations. Thirdly, this limitation of time leads to another limitation — that of calculations. Lastly there is a limitation concerning techniques. Maps must be simple in design; they will probably use black and white even though colour could be used if necessary; these factors help to speed up the time needed for publishing while decreasing the cost.

In light of the above limitations, computer mapping could be available. It is possible to make some preparations long before data are received; e.g., the outline and reference points for data for each of the four regional maps. Once established, these can be used over and over again. Furthermore, any number of maps could be run off, altering categories of grouped data to see which maps are the best. All in all computer mapping is very feasible in view of the time constraint.

There could perhaps be some sort of compromise between the two types of mapping (i.e., computer and traditional) according to the demands of each map.

3.2 Mapping Table 1

In Tables 1 (a) and 1 (b) there are many ways of dealing with out-commuters or incommuters. For example, a graded circle could show the number of resident workers and part of that circle could show the portion of out-commuters (e.g. Map 9) or incommuters could be shown as a portion of the total labour force. A combination of graded circles and shading can also be used for either table. (See Map 10.) In view of the limitations explained in the

previous paragraph, these methods are feasible on the basis of simplicity, cost, and scale although not as much so with regard to time. However, if there is only one map per type of table, only in- or outcommuters could be dealt with, not the two at the same time. This could be overcome by using another method. Graded circles can be drawn for both in- and outcommuters (one white, one black) and drawn one inside the other. (See Map 11.) The advantages and disadvantages of the method have already been mentioned (in Part Two, pp. 7, 8). This map requires traditional methods but minimum calculations and a total of only 264 symbols.

3.3 Mapping Table 2

Tables 2 (a) and 2 (b) also deal with data by counties. Since origins and destinations are known, it is possible to show movement.

A combination of graded circles and shading may be used. One could, for example, show the number of outcommuters from each county and the percentage of the resident labour force which outcommutes. However, such mapping can be done using the data of Tables 1 (a) and 1 (b); i.e., a static representation. Therefore, although this is an interesting method of mapping, it is not uniquely applicable to these tables.

Isopleths could also be used although there are several difficulties. First, the use of isopleths involves calculations. Secondly, central counties of attraction only could be dealt with. These could be chosen from the mapping of Tables 1 (a) and 1 (b). Thirdly, it would be difficult to determine exactly where to draw the isopleths due to the large sizes of some of the counties. These disadvantages would seem to discourage the use of isopleths for counties. However, isopleths may be more feasible in this case if done using computer methods.

Desire lines could be used in some cases, specifically in the Eastern and Central provinces. However, in the West, counties are so large that desire lines at this level would show little interaction.

A system combining graded circles and arrows can also be used. First, mapping would have to be limited to those counties which were attractive (i.e., those counties, as seen by mapping Tables 1 (a) and 1 (b) which have more incommuters than outcommuters). The graded circles would then represent the number of incommuters into each county while graded sizes of arrows would show from which direction the commuters were coming. Even having limited such mapping to attractive counties, however, there may still be problems of clutter; for example, drawing a graded circle in one county at the same time as one is trying to draw an arrow out of that county. This problem could be eliminated if circles were dropped entirely and only the arrows were used.

If the mapping were not limited to black and white, colouring could be very useful. For example, a graded circle could represent the number of outcommuters while the circle could be divided by colours to show the various destinations. This could only be done on a limited, regional level.

Of the above suggestions the method of using arrows and attractive counties (as defined by the cartographic method used for Table 1) may be the best, both origins and destinations being limited.

3.4 Mapping Table 3

Tables 3 (a) and 3 (b) deal with movement of workers at the municipality level.

Desire lines may be of use in mapping these tables. However, since mapping both urban and rural municipalities would result in too many lines,

the urban and rural municipalities should be added together (i.e., add out-commuters from urban municipalities within one rural municipality with those from the rural municipality). Furthermore, there will have to be a limit set on the number of commuters with which one is interested. This will be a minimum figure and will be dependent upon the census results. No matter how we limit the numbers, there is still bound to be crossing of lines, especially in Southern Ontario. This is not necessarily bad, however, as this interaction is exactly the phenomenon with which we must concern ourselves in this case.

Isopleths could be used in mapping these data. Again, however, calculations would have to be made if traditional mapping methods are used. Furthermore, one runs into the problem of distinction being made between urban and rural municipalities. In such a case, the best solution may be to add together urban and rural communities (as above). One will then be presented with the problem of exactly where to draw the isopleth. However, the choice of isopleths can be made by computer. A different map can be prepared for several percentages of outcommuters going to the urbanized core of the nearby CMA as a percentage of the total labour force or as a percentage of all out-commuters. Once a base map is made for computer mapping and data points laid down, isopleths drawn by computer will be much easier than those by hand. For publication purposes, a selection of the most characteristic isopleths should be done.

These, then, are the conclusions concerning publication: Table 1 by county, two circles (static); Table 2 by county, desire line (dynamic); Table 3 by municipality, isopleths by computer mapping.

General Conclusions on the Essay

This project on the cartographic representation of journey-to-work data is a preliminary study on a new question. For this reason, it has been largely theoretically oriented and should be followed by more practical analysis. The question of "what" to map has been specified; it is the "how" of mapping that remains to be done in more detail. As the methods discussed in this paper are attempted, further advantages and disadvantages will be discovered. This process of experimentation will be a most valuable way of determining the best cartographic techniques to apply to journey-to-work data.

TABLE 1 (b). Employed Labour Force by Sex, Showing Usual Place of Work
by Usual Place of Residence for Counties and
Census Divisions, 1971

Usual place of work and sex	Total employed labour force working in the area	Living in same county			Living in different county
		Total	Same municipality	Different municipality	

TABLE 2 (a). Employed Labour Force by Sex, Showing Usual
Place of Residence by Usual Place of Work
for Census Divisions, 1971

Usual place of residence by usual place of work	Total	Male	Female
CANADA			
Nfld.			
Division No. 1			
Employed labour force living in area			
Working in the same county			
At home			
Elsewhere			
Working in different county			
Given destinations			
Place of work not stated			

TABLE 2 (b). Employed Labour Force by Sex,
Showing Usual Place of Work by
Usual Place of Residence for
Census Divisions, 1971

Usual place of work by usual place of residence	Total	Male	Female
CANADA			
Nfld.			
Division No. 1			
Total employed labour force working in the area			
Living in the same county			
Living in different county			
Given origins			

TABLE 3 (a). Employed Labour Force by Sex, Showing Usual Place of Residence by Usual Place of Work for Census Subdivisions, 1971

Usual place of residence by usual place of work	Total	Male	Female
CANADA			
Nfld.			
Division No. 1			
Mun. No. 1			
Employed labour force living in area			
Working in the same municipality			
At home			
Elsewhere			
Working in different municipality			
Given destinations			
Place of work not stated			

TABLE 3 (b). Employed Labour Force by Sex, Showing
Usual Place of Work by Usual Place of
Residence for Census Subdivisions, 1971

Usual place of work by usual place of residence	Total	Male	Female
CANADA			
Nfld.			
Division No. 1			
Mun. No. 1			
Total employed labour force working in the area			
Living in the same municipality			
Living in different municipality			
Given origins			

TABLE 4 (a). Employed Labour Force by Sex, Showing Usual Place of Residence by Usual Place of Work (Census Tract No. and Count) in Order of Frequency, 1971

City X					
Census tract of residence			Census tract of work		
Number	Total	Not stated	No.		
1 T M F		T M F	T M F		
2 T M F		T M F	No.		
			T M F		
3 T M F		T M F	No.		
			T M F		
4 T M F		T M F	No.		
			T M F		

TABLE 4 (b). Employed Labour Force by Sex, Showing Usual Place of Work by Usual Places of Residence (Census Tract No. and Count) in Order of Frequency, 1971

City X				
Census tract of work			Census tract of residence	
Number	Total	No.		
1			T	T
			M	M
			F	F
2			T	No.
			M	
			F	
3			T	No.
			M	
			F	

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